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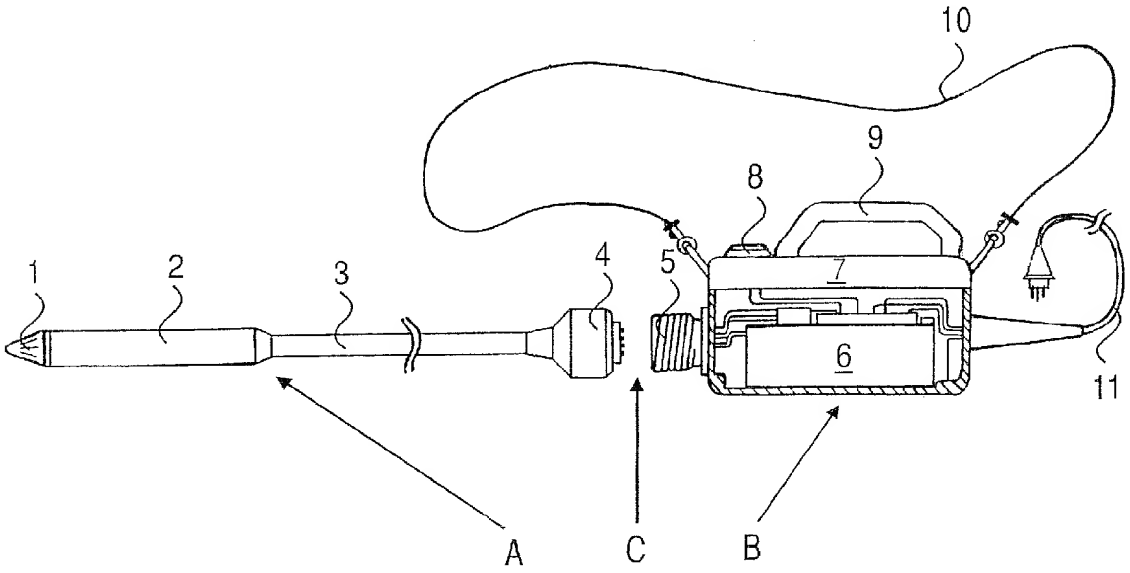
(54) Immersion vibrator powered by a transformer

(57) An immersion vibrator powered by a transformer (B) is provided with an electric vibrating needle (A). A coupling (C) is provided, which consists of an electromechanical plug (4) and an electromechanical socket (5) which are provided on the electric vibrating needle (A) and on the electrostatic transformer (B) or vice versa. The vibrating needle (A) is provided with an electromechanical codified plug (4), so that from time to time it can be disconnected from the transformer (B) and replaced with another one by the user. Thus, immersion vibrators can be employed in a more flexible way and can be manufactured in a more economical way.



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Description

[0001] The invention relates to an immersion vibrator according to the preamble of claim 1.

[0002] From the state of the art are known miniaturized static transformers, in which an inseparable connection between transformer and vibrating needle is accomplished. Only in this way the safe operation of the electric transformer from one to three phases can be assured. Such a vibrator is known from European Patent 0 604 723.

[0003] The conventional frequency controls for asynchronous motors in a range up to 10 kW operate with impulse width modulation. In this case, a processor compares the measured sinusoidal phase current with sine data stored in a memory. The carrier frequency, in which the transistor modules are driven, is much higher than 2 kHz. No impulse width modulation is carried out with motors having a very high performance and voltage range, and a sinusoidal voltage in the multilevel operation is obtained. Direct current sources at different levels are therefore connected to the motor phases.

[0004] The inseparability of the connection between transformer and immersion vibrator prevents a quick replacement of the units at the building site.

[0005] Object of the invention, which is outside the state of the art, is the improvement of an immersion vibrator according to the above state of the art in order to allow its simple utilization at building sites.

[0006] This object is achieved according to the invention, by virtue of the characteristics of claim 1.

[0007] Further advantageous embodiments are described in the dependent claims. Following, the present invention is disclosed with the help of the attached drawing. The latter shows a schematic view of a portable immersion vibrator with an electrostatic driving unit for a phase alternate current.

[0008] Reference A indicates the plug-in electric vibrating unit, which comprises a vibrating cylinder 2 with electric motor and unbalanced flywheel. The latter can have various sizes. Vibrating unit A ends with a rubber tip 1. The opposite extremity of vibrating unit A ends with a member 4 of an electromagnetic plug C, so that the coupling member 4 is connected with vibrating cylinder 2 through a protective sleeve 3. Protective sleeve 3 can be provided with various lengths. An electrostatic plug-in driving unit is indicated with reference B. It comprises a low frequency converter 6, which is preferably provided as an interchangeable unit and which is arranged in an aluminum housing 7 consisting of two parts. Converter 6 is operated by an on-off switch 8. A handle 9, preferably removable, is fastened to driving unit B and, for practical use, the immersion vibrator is provided with a shoulder-strap 10. A cable inlet 11 with cable and plug is connected to driving unit B for electrical supply. Driving unit B comprises a threaded member 5 of the electromechanical coupling C.

[0009] Thus, vibrating unit A can be separably connected to driving unit B through electromechanical plug C.

[0010] The electrical immersion vibrator for concrete thickening comprises the electric vibrating unit A and electrostatic transformer B. The electric vibrating unit A comprises a three-phases asynchronous squirrel cage motor 2 with eccentric flywheel, supply cable, protective sleeve 3 and electromechanical plug 4 for the connection to the transformer unit.

[0011] Electrostatic transformer B comprises an inverter from a single-phase input to a three-phases output. Transformer B is also provided with an integrated switch 8 and a supply cable with plug 11, as well as the electromechanical socket 5 for the electric vibrating needle.

[0012] The present motor control works according to the principle of transformers for high and very high power ranges. Therefore, a continuous voltage is modulated in a first stage at different levels and then converted at a low frequency. The output transistors work at the motor nominal frequency, that is 200 Hz, so that only few electromagnetic compatibility problems occur.

[0013] The first stage is advantageous since it quickly recognizes a possible short circuit or an electric breakdown, and no indefinite working states may occur. Furthermore, the first stage switches off in case of an electric breakdown and transformer 6 has to be started up again, after its reconnection with the needle.

[0014] For these reason, this form of control is suitable for systems wherein a motor electrical breakdown is foreseeable or inducible.

[0015] The advantages of this immersion vibrator further lie in the possibility of disconnecting vibrating needle A from electric transformer B, without damaging the electronics.

[0016] Transformer 6 can thus be used with different kinds of needles A. The user has always needed to use different kinds of needles, having different sizes and different sleeve lengths according to the reinforcement type, to the concrete depth, and so on. Now, the present solution allows the user to use different kinds of vibrating needles A with only one transformer B. An inexpensive and customizable solution is obtained, in which the immersion vibrator can be provided as a portable version or as a trail transformer, which may be coupled with sleeves having different lengths. Transformer B itself can be adapted to different vibrating needles A having different performances and sleeve lengths.

[0017] Advantageously, the electromechanical plug-in coupling C is codified, so that transformer B can identify and automatically fit vibrating needle A.

[0018] The replacement of a malfunctioning vibrating needle A or transformer B can be carried out by the user himself.

[0019] For people's safe, the transformer is provided with an integrated security current switch for malfunctions. Thanks to thermometric probes, a thermal protection of transformer B and vibrating needle A is ensured.

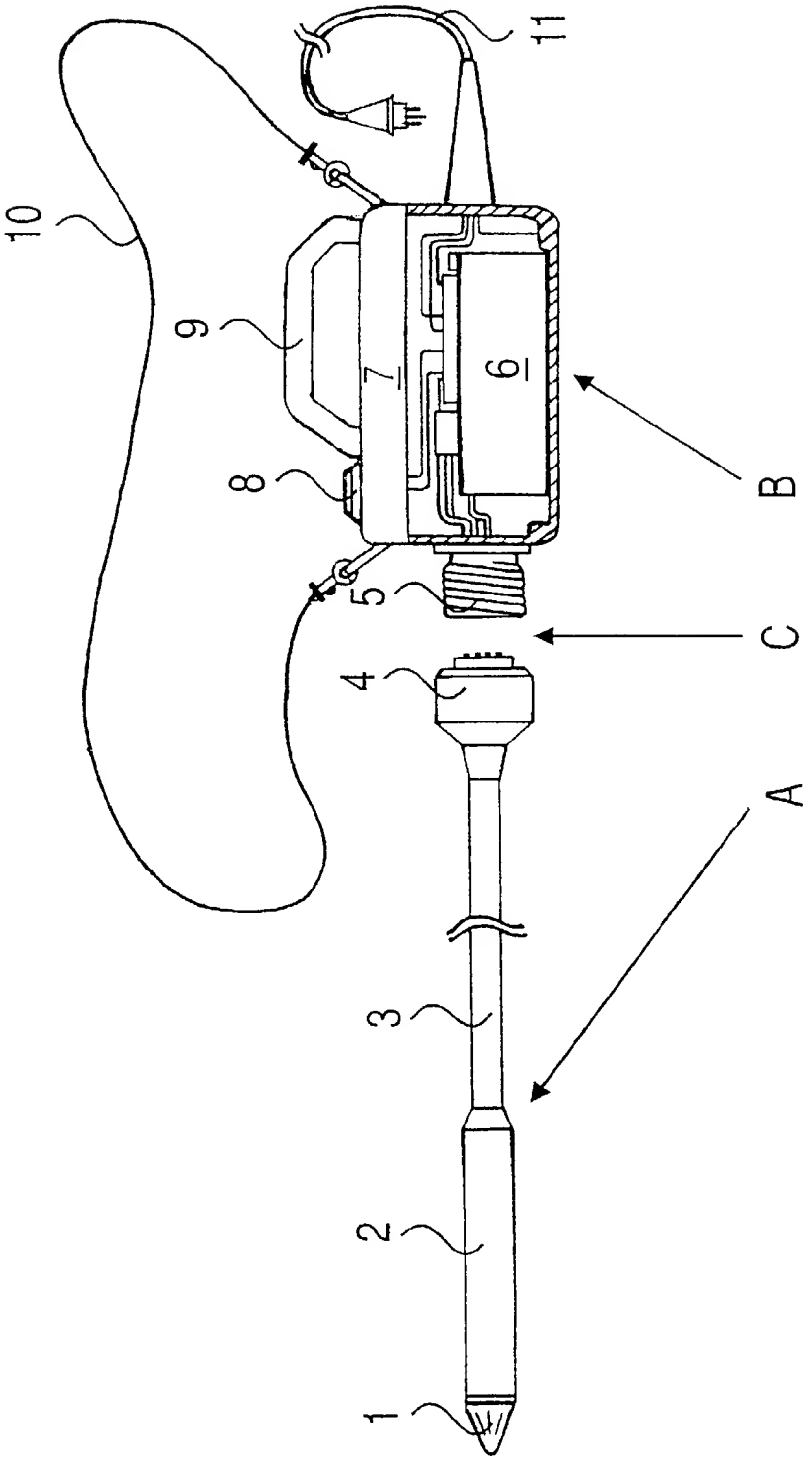
Claims

1. Immersion vibrator powered by a transformer (B), provided with an electric vibrating needle (A), characterized in that a coupling (C) is provided for the separable connection between the vibrating needle (A) and the transformer (B), said coupling (C) consisting of an electromechanical plug (4) and an electromechanical socket (5), which are provided on the electric vibrating needle (A) and on the electrostatic transformer (B) or vice versa.

2. Immersion vibrator according to claim 1, characterized in that the electromechanical coupling (C) provides on each vibrating needle (A) a suitably codified electromechanical plug (4), which fits into correspondent complementary switches in the socket (5) of the electrostatic transformer (B).

3. Immersion vibrator according to claim 1 or 2, characterized in that the electrostatic transformer (B) is provided with a shoulder-strap (10) or with a handle (9) or is provided as a trail transformer.

4. Immersion vibrator according to any of the preceding claims, characterized in that the electrostatic transformer (B) comprises a safety switch, so that the electric vibrating unit (A) can be disconnected during the operation from the electrostatic transformer (B) without damaging the latter.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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0335

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 3 782 693 A (STROHBECK G) 1 January 1974 (1974-01-01) * column 2, line 35 - column 4, line 22 * * figures *	1-4	E04G21/08
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P,X	FR 2 761 391 A (ELECTRONIQUE AU SERVICE DU BET) 2 October 1998 (1998-10-02) * page 2, line 25 - page 3, line 15 * * page 5, line 6 - line 25 * * figures 1,6 *	1,2	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E04G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 September 1999	Andlauer, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 83 0335

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82